

## CLAIMS

What is claimed is:

1. A system for creating a custom fit, artificial fingernail, the system comprising:

a non-contact measuring system operably measuring a three-dimensional topography of a natural fingernail, the measuring system comprising a light source and a camera; and

a machining device operably creating the artificial fingernail using the three-dimensional topography of the natural fingernail, the artificial fingernail custom fitting the natural fingernail.

2. The system of claim 1 wherein the light source is a white light, and the non-contact measuring system receives at least one two-dimensional image of the natural fingernail and calculates the three-dimensional topography of the natural fingernail.

3. The system of claim 1 wherein the light source is a laser, and the non-contact measuring system scans the natural fingernail and calculates the three-dimensional topography of the natural fingernail.

4. The system of claim 1 wherein the non-contact measuring system converts the three-dimensional topography of the natural fingernail into a machine code for the machining device.

5. The system of claim 1 further comprising a design system for designing the artificial fingernail wherein the design system uses the three-dimensional topography of the natural fingernail in the design of the artificial fingernail.

6. The system of claim 1 wherein the machining device is a computer numerical control device for receiving machine data for milling a material into the artificial fingernail.

7. The system of claim 1 further comprising a measuring and design system operably receiving the three-dimensional topography of the natural fingernail and converting the three-dimensional topography into a data structure, wherein the data structure comprises the design of the artificial fingernail.

8. A system for creating a customized artificial fingernail with a measured fit to a natural fingernail, the system comprising:

a non-contact optical measuring device for measuring a three-dimensional topography of a natural fingernail and providing measurement data for the natural fingernail;

a measuring and design system for receiving the measurement data and designing an artificial fingernail wherein at least a portion of the artificial fingernail will fit the natural fingernail wherein the design of the artificial fingernail will be converted into machine data; and

a machining device for receiving the machine codes and machining the artificial fingernail.

9. The system of claim 8 wherein the optical measuring device comprises a white light for taking at least one two-dimensional image of the natural fingernail and calculating the three-dimensional topography of the natural fingernail.

10. The system of claim 8 wherein the optical measuring device comprises a laser wherein the optical measuring device scans the fingernail and calculates the three-dimensional topography of the natural fingernail.

11. The system of claim 8 wherein the machining device is a computer numerical control device for receiving the machine codes and for milling a material into the artificial fingernail.

12. The system of claim 8 wherein the machine data are machine codes and the machining device is a computer numerical control device.

13. An artificial fingernail that is milled from a material by a computer numerically controlled device to fit the topographical surface of a natural fingernail for attachment to the natural fingernail wherein the artificial fingernail is custom designed for the natural fingernail, the artificial fingernail comprising:

a milled undersurface of the material comprising a milled fitted portion, wherein the fitted portion matches the topographical surface of the natural fingernail;

a milled top surface of the material comprising the customized design;

a proximal end of the material fitting the cuticle shape of the natural fingernail; and

a distal end of the material.

14. The artificial fingernail of claim 13, wherein the material is plastic.

15. The artificial fingernail of claim 13, wherein the material is metal.

16. A process for creating a custom fit, artificial fingernail for use with a natural fingernail comprising:

measuring a three-dimensional topography of the natural fingernail in a non-contact manner, at least in part through non-contact sensing; and

forming the artificial fingernail using the three-dimensional topography of the natural fingernail to create a custom fit of the artificial fingernail on the natural fingernail.

17. The process of claim 16 further comprising:

photographing a natural fingernail grid image with a camera wherein the light source is a white light for projecting a two-dimensional grid onto the natural fingernail;

converting the two-dimensional grid image into the three-dimensional topography of the natural fingernail; and

converting the three-dimensional topography of the natural fingernail into machine data for the machining device.

18. The process of claim 16 further comprising:

scanning the natural fingernail with a laser for calculating the three-dimensional topography;

converting the three-dimensional topography of the natural fingernail into machine data for the machining device.

19. A process for custom designing an artificial fingernail for use with a natural fingernail, the process comprising the steps of:

measuring a three-dimensional topography of the natural fingernail with a non-contact measuring system;

selecting parameters for the artificial fingernail, wherein the parameters are selected from the group consisting of thickness, length, and style;

calculating a three-dimensional shape of the artificial fingernail from the three-dimensional topography of the natural fingernail and the parameters for the artificial fingernail; and

machining the artificial fingernail wherein the artificial fingernail custom fits the natural fingernail.

20. The process of claim 19 further comprising the step of:

converting the three-dimensional shape of the artificial fingernail into a machine data for the machining of the artificial fingernail.

21. The process of claim 20 wherein the machine data are machine codes.

22. The process of claim 19 further comprising the step of:

displaying the three-dimensional shape of the artificial fingernail before the step of machining the artificial fingernail.

23. A computer implemented process for designing custom artificial fingernails for fitting a natural fingernail based on an optical image of the natural fingernail, the process comprising the step of:

receiving from an optical imaging device image data defining a surface of a finger comprising a surface of a natural fingernail;

extracting from the image data a portion of image data that defines the surface of the natural fingernail;

selecting a design for the artificial fingernail;

creating a three-dimensional data structure for the artificial fingernail wherein the data structure comprises the data that defines the surface of the natural fingernail and the design for the artificial fingernail; and

converting the three-dimensional data structure into machine data for cutting the artificial fingernail out of a material.

24. The process of claim 23 wherein the image data defines a surface of a plurality of fingers comprising a plurality of surfaces of natural fingernails.

25. The process of claim 23 wherein the step of selecting a design for the artificial fingernail further comprises the steps of:

selecting a length of the artificial fingernail;

selecting a thickness of the artificial fingernail; and

selecting a style of the artificial fingernail.



26. The process of claim 23 wherein the step of creating a three-dimensional data structure further comprises the steps of:

defining a top surface of the artificial fingernail wherein a portion of the top surface corresponds to the boundary of the surface of the natural fingernail;

defining a length of the artificial fingernail;

defining a thickness of the artificial fingernail; and

defining a style of the artificial fingernail.

27. The process of claim 23 wherein the three-dimensional data structure is converted into machine codes readable by a computer numerically controlled device for cutting the artificial fingernail out of the material.

28. The process of claim 23 wherein the machine data are machine codes suitable for a computer numerically controlled machine.

29. A computer implemented process for designing custom artificial fingernails for fitting natural fingernails based on an optical image of the natural fingernails, the process comprising the step of:

receiving from an optical imaging device image data defining a surface of a plurality of fingers comprising a surface of a plurality of natural fingernails;

extracting from the image data portions of image data that define the surfaces of the plurality of natural fingernails;

selecting at least one design for a plurality of artificial fingernails;

creating a plurality of three-dimensional data structures one for each of the plurality of artificial fingernails wherein each data structure comprises the data that defines one of the surfaces of each of the plurality natural fingernails and the design for the artificial fingernail; and

converting the three-dimensional data structures into machine data for cutting the plurality of artificial fingernails out of a material.

30. The computer implemented process of claim 29 wherein the machine data are machine codes suitable for a computer numerically control machine.